

SYSTEMS THINKING

the ability to recognize and analyse the inter-connections within and between systems

Glenn Strachan, International Research Institute in Sustainability, University of Gloucestershire

The formal education experience of most learners could be summarised as moving from a multi-disciplinary approach in their early years, grounded in their limited experience of the world, through to an increasingly reductionist experience in which they become more specialised and less prepared for the inter-connected complexity of the world in which they have to live and work. This is a gross generalisation, but it does partly explain some of the unsustainable activities that have had such a detrimental impact on the natural systems of the Earth. In particular it helps to account for the large catalogue of examples of good intentioned solutions to problems having unforeseen consequences and resulting in greater problems than the one that was trying to be solved.

Increasing numbers of analysts writing about the crises facing the world are identifying the inter-connected nature of the crises and the need for inter-connected and inter-disciplinary solutions. For example Jeffrey Sachs in his latest book *Common Wealth* comments that ‘The problems just refuse to arrive in the neat categories of academic departments’ (Sachs 2008:14). The established structures of the formal education system are resistant to change and nowhere in the formal system is there a coordinated attempt to bring together the array of knowledge, skills and attitudes which learners gather through their educational career so that they can use them to make better sense of our complex world. Developing the ability to think systemically gives learners of all ages the potential to maximise the application of their diverse learning experiences and contribute to how we can better understand our complex inter-connected world.

Ray Ison provides the following concise definition of the term *system* which leads us into the area of inter-connectedness: ‘A system is a perceived whole whose elements are “inter-connected”’ (Ison in Reason and Bradbury 2008:140). Systems thinking has developed a substantial body of knowledge, drawn from a number of areas of study including cybernetics, ecology and complexity theory. References to resources which provide some of the theoretical underpinnings of systems thinking are offered at the end of this chapter. The purpose of this chapter is to focus on one aspect of systems thinking, which is the ability to recognize inter-connections and understand the relevance and the importance of the relationships represented by these inter-connections. This is essential for understanding the nature of the sustainability crises we face and therefore essential in finding solutions. The use of pesticides on crops is one example of how a solution to one problem has created further and greater problems. While trying to combat a pest or disease to improve food production, pesticides in many cases have disrupted ecosystems, some of which indirectly support the crop being grown, and have had adverse health effects on people from pesticide residues on food crops. Place the use of pesticides into the context of the ‘Green Revolution’ of the 1970s where they were part of a package with artificial fertilizers, financial credit, irrigation and increased mechanisation, and the inter-related social, environmental and economic consequences become complex.

According to Ison (2008), most people have some degree of systemic awareness, the question is how can educators develop and increase that awareness? In the same way that we need to understand unsustainability in order to fully grasp sustainability, so by highlighting an obvious lack of systems thinking in an example it is possible to demonstrate to learners the nature of systems thinking in a practical way. One way of approaching this is to look for examples in everyday life that illustrate a lack of systems thinking through an inherent contradiction that may not be obvious to many people. Advertisements can be a rich source of these examples; for instance in a recent Sunday newspaper an advert for a large 4x4 SUV pictured the vehicle driving down a flooded street and promoted the vehicle as a solution to living in adverse weather conditions. When the connections have been made in one's mind that the adverse weather conditions may have been the result of climate change and that CO₂ emission from vehicles contribute to climate change, then suddenly the incongruity of the image leaps out. Once these types of connections have been demonstrated to learners, some of them (but as Ison rightly says, not all) will start noticing similar examples, developing a perspective that highlights connections and will be thinking more systemically. As Fritjof Capra puts it 'Systems theory entails a new way of seeing the world and a new way of thinking known as systems thinking or systemic thinking. It means thinking in terms of relationships, connectedness and context' (Capra 1999: 2).

This approach enables learners to discover an understanding of systems thinking for themselves and this can be reinforced if they are given the opportunity to apply that understanding to a context with which they are familiar. In so doing they can become more at ease with the inter-connected nature of the world and less overwhelmed with its complexity. A simple exercise for learners to apply systemic thinking and discover how everything is linked involves them selecting an object with which they are very familiar and investigating it by asking a series of questions. (Questions can be simple e.g., What is it made of? Where has it come from? Who made it? or more searching, e.g. What needs does it fulfil? Is it necessary? What will happen to it in the future? Could it be redesigned to have a smaller environmental footprint?). Learners record their answers to the questions on a large sheet of paper and then start identifying connections between their answers, producing a web-like diagram. This activity can extend almost indefinitely depending on the enthusiasm of the learners and it will lead them across economic, social and ecological systems.

Developing an understanding of the relationship between elements within a system is a building block in learning towards appreciating the relationships that connect systems to each other. The concept of 'nested systems', where there is a hierarchy of inter-connected systems, is an aspect of systems thinking that has particular relevance for conceptualising sustainability from a systems perspective. Educators can explore this with learners, and gain an insight into the perspectives held by learners, by presenting the two most common diagrammatic representations of sustainability and asking the learners to describe the 'messages' that the diagrams convey to them, particularly about the relationships between the three sets of systems.

Having used this activity with a range of learners I have found that there are a number of common areas that usually emerge for discussion. The response from learners with regard to Figure 1 (at end of chapter) usually generates discussion around the idea that the relationship between the systems in the three circles is one of 'balance' or possibly 'trade-off'. There is

often the suggestion that the relative size of the circles could be changed and that a much larger economic systems circle would be more representative of the three sets of systems when it comes to decision-making in the world of today. Learners recognise that there is a strong connectivity between the systems represented by the three circles, but are much less clear about the relationships associated with these connections.

The response to Figure 2 (at end of chapter) often generates a dichotomy in terms of responses from learners, illustrating the different perspectives they hold. Some see the ecological systems as representing a known fixed boundary inside which all the human social systems must exist, and economic systems existing within the boundaries of social systems since they are one of those systems. Others see economic systems as being at the centre of everything and therefore being the most important.

Systems thinking has much to contribute to sustainability literacy; it can provide a perspective that enables learners to engage with the complexity of sustainability and the complexity of the world around them. Recognising the inter-connections within systems and between systems, and exploring the relationships which these inter-connections represent, is a learning pathway to a systems thinking perspective.

Capra, F. (1994) *From the parts to the whole: systems thinking in ecology and education*.
www.hainescentre.com/pdfs/parts_to_whole.pdf

Capra, F. (1999) *Ecoliteracy: the challenge for education in the next century*.
www.ecoliteracy.org/publications

Ison, R. (2008) Systems thinking and practice in action research. In P. Reason and H. Bradbury. *The handbook of action research: participative inquiry and practice*. Sage: London

Laszlo, E. (1972) *The systems view of the world*. Blackwell: Oxford

Sachs, J. (2008) *Common wealth: economics for a crowded planet*. London: Allen Lane

Bowers, C. Writings on education, eco-Justice, and revitalizing the commons.

www.cabowers.net [a large collection of articles and on-line books by Chet Bowers]

Centre for Ecoliteracy. www.ecoliteracy.org [includes a range of relevant writings by Frijtof Capra]

Systemic Development Institute. <http://systemicdevelopment.org> [an international network of professionals committed to fostering systemic thinking and practice for ethical action in a turbulent world]

Figure 1

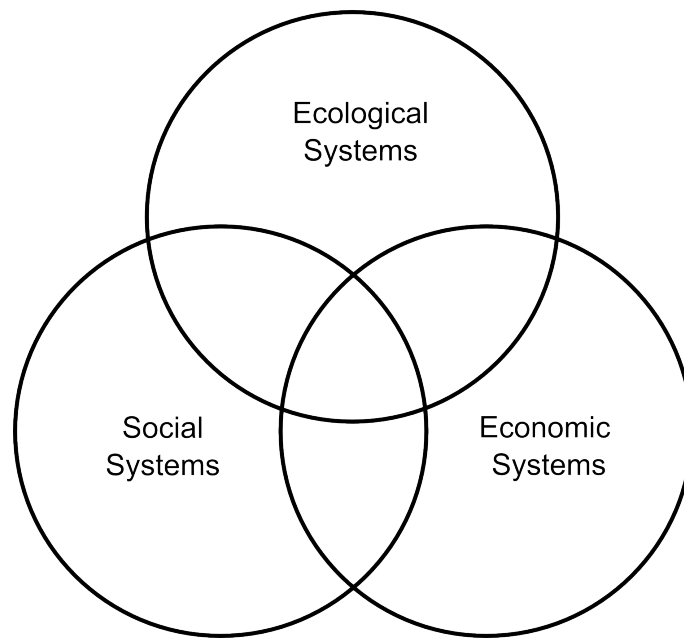


Figure 2

